

The Story is Beginning From...

Where Oil Came From?



Oil → gasoline, solvents, plastics,..
Hydrocarbon chemistry is un-nature

Problem To Be Solved

1. The existing surface treatments and surface finishing do not have good adhesion with the substrates.
2. The poor durability of existing surface treatments and surface finishing create significant corrosion issue and short lifetime.
3. The existing metal surface treatments need huge amount of chemicals and water that generate serious environmental impact.
4. The existing paints use mainly organic resins and solvents that creates more environmental pollution.
5. Organic resins and plastics have became one of the worst pollution for eco system. How to decrease the usage is a challenge.

Started from Aviation industry

Modern Aircraft Structure:

Al alloys(Ti alloys) with anodizing
(CAA, PAA,--)+ Primer +Film
Adhesives



Chemat's Approach:

Strong chemical bonding
provides even stronger adhesion



Core Technologies & Competence

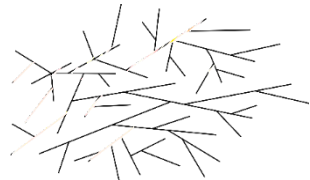
What is Nano Hybrid Resin ?

Hybrid Resin = Nano composites
= Nano organo-

ceramics



Oxide particles



Organics
group

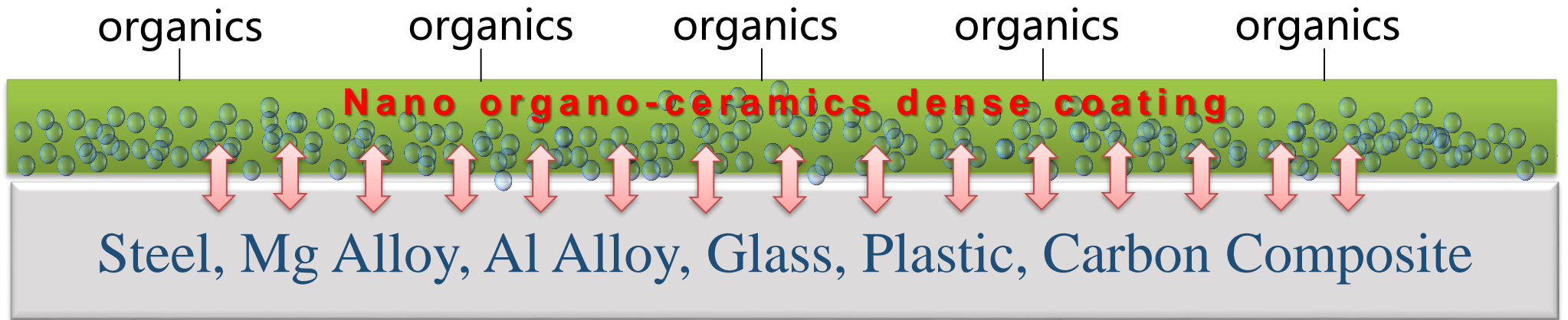
Nano size
10-50 nm
(Al₂O₃, SiO₂,
MgO, ---)

Hybrid resins can be applied easily



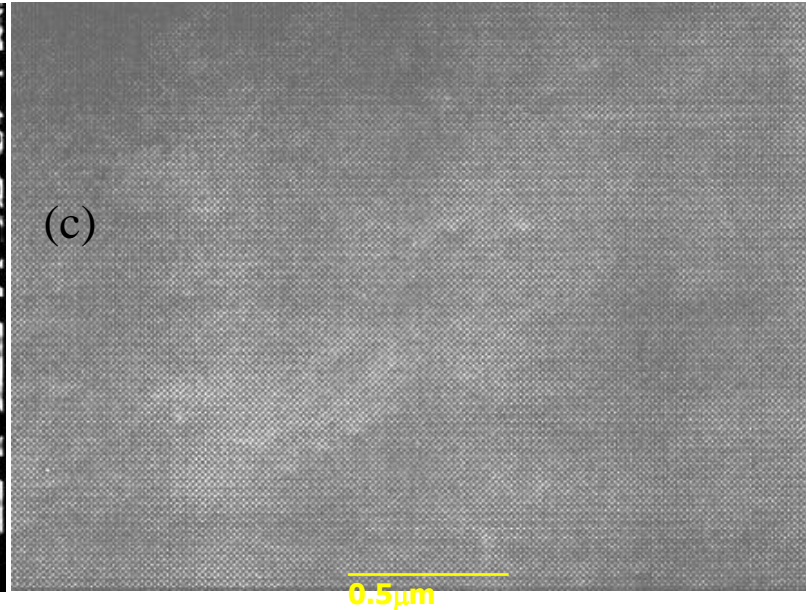
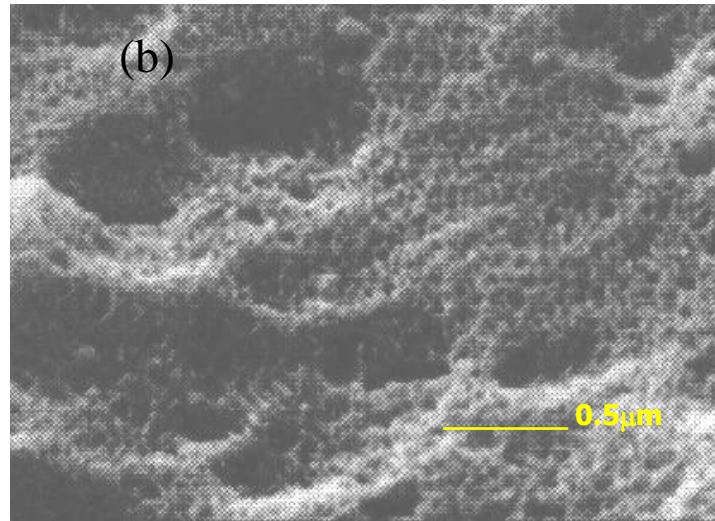
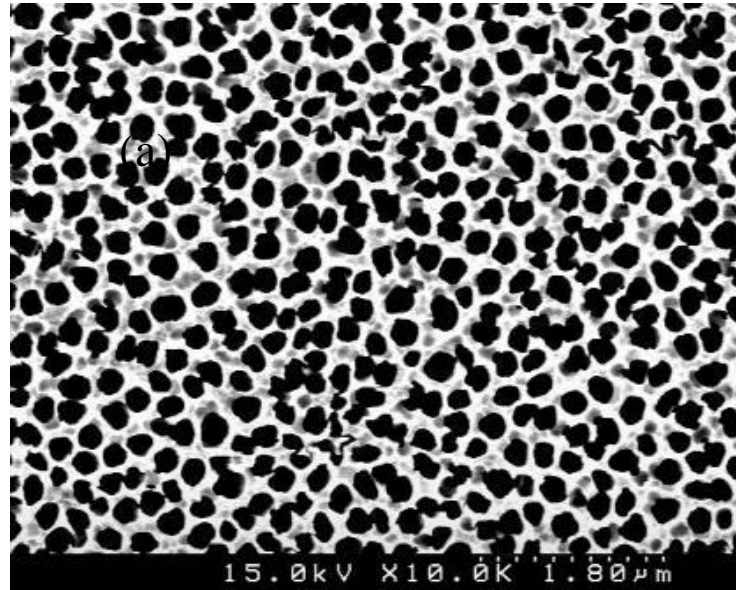
Metal oxide/carbohydrate backbone vs. hydrocarbon backbone

Nano Hybrid Coating



↑
Strong chemical bonding due to the nano-oxides active surface to react with substrate

“Tailor made oxidation”

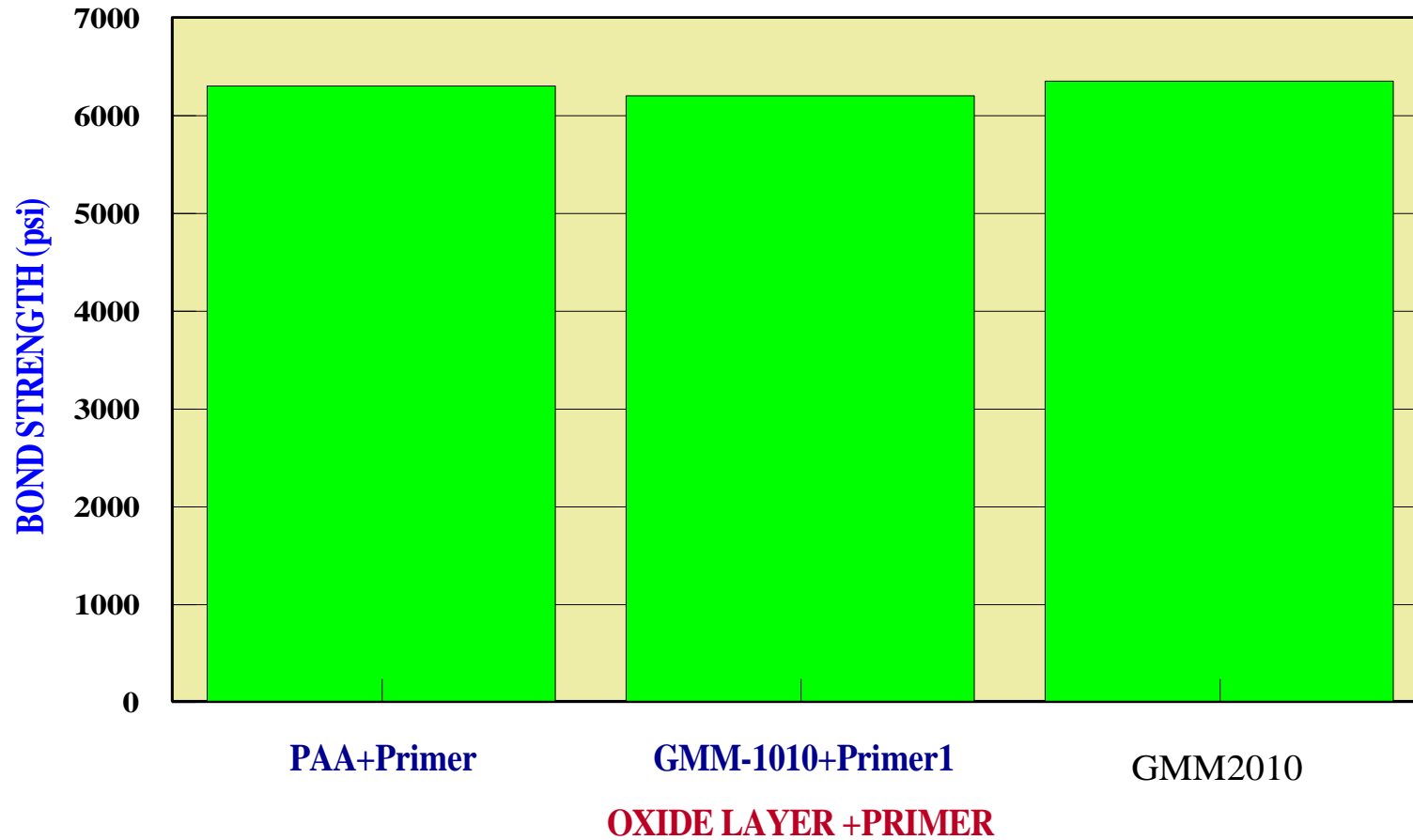


- (a) **Chromic acid anodized aluminum surface**
- (b) **Chromate conversion coating**
- (c) **Nano-ceramic coating on aluminum**

Only Nano-ceramic coating provide a dense structure comparing to the porous nature of other coatings

STRONG ADHESIVE BONDING

Cohesive Failure

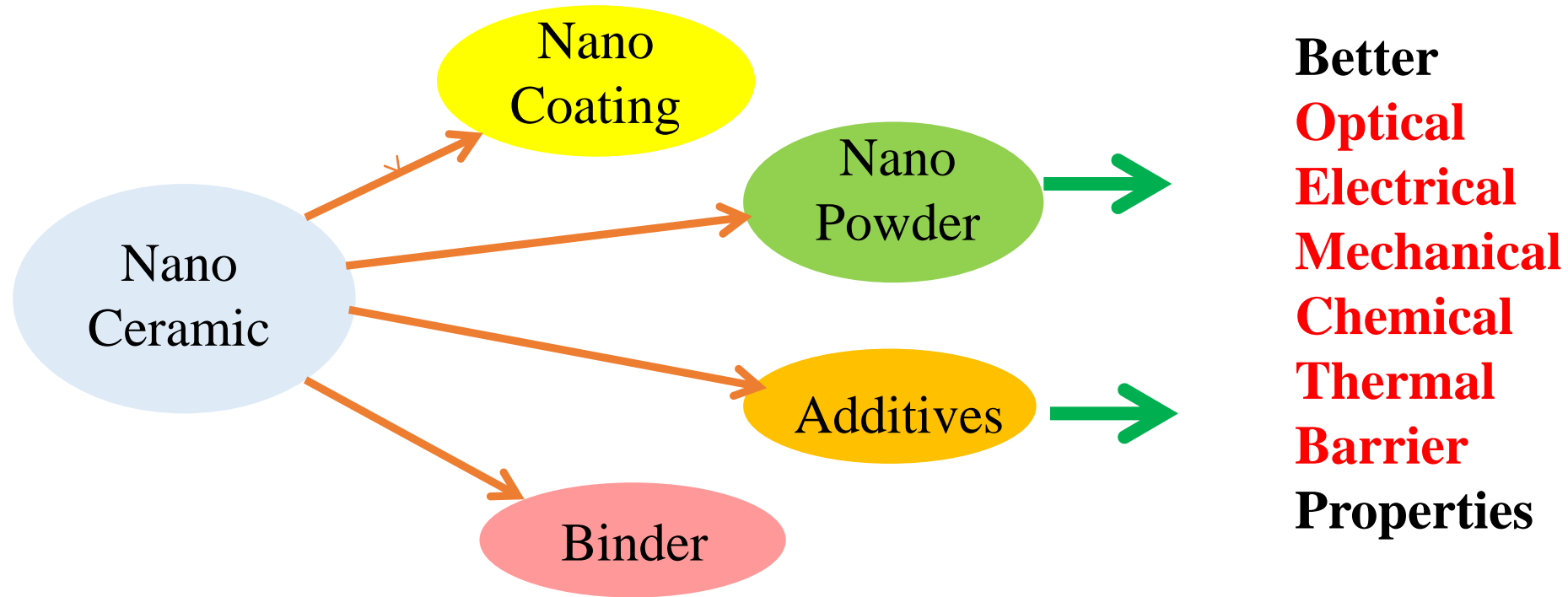


Bonding strength on Al alloy for PAA and Chemat's processes

The Characteristics of Nano Ceramics Hybrid Resin

- High solid content, low VOC, water-borne or water-base.
- Can direct bond to inorganic and plastic substrates with strong adhesion.
- High surface hardness and mechanical strength.
- Good weatherability and low gas permeability
- Higher or no glass transition point
- Good thermal stability and non-flammable
- High breakdown voltage
- High transparency with high gloss

What Nano-Ceramics Resin Can Do



Can replace **organic resins** in many applications.
ceramic fillers

Nano Hybrid Resin Coatings on Zn-Plated Fasteners



Top 1: Yellow Chromate Zn-plated steel screw with nano coating showed slight corrosion after 1,000hr. salt spray test.

Bottom 3: Regular yellow-Chromate Zn-plated steel screws have been corroded badly after 500hr. salt spray test.

Nono Hybrid Resin Coatings on Zn-Plated Fasteners



Zn 1000

WR > 480hr
RR > 1000hr

Coat 2-3 μ m nano resin coating on 5-7 μ m of Zn plated with Cr3+ conversion



Black 1000

WR > 480hr
RR > 1000hr

Coat 2-3 μ m black nano resin coating on 5-7 μ m of Zn plated with Cr3+ conversion



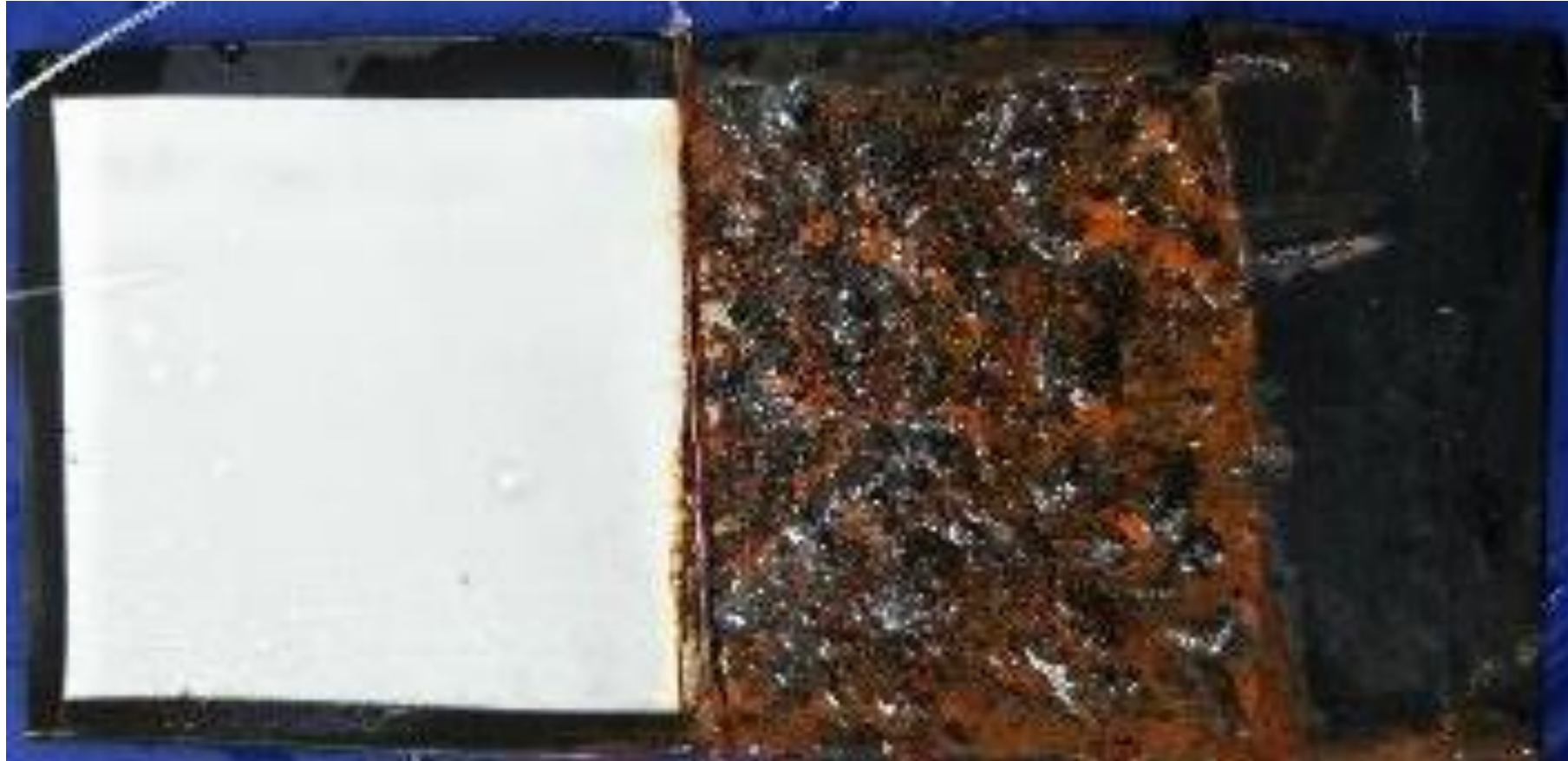
Zn 2000

WR > 480hr
RR > 1000hr

Coat 3-5 μ m nano resin coating on 10-12 μ m of Zn plated with Cr3+ conversion

Zn 2000 has become the best replacement for stainless steel screw

Room Temperature Cure Nano AE900Z Zn-rich Paint /AE900AB Topcoat



After 2000 hours salt spray test, the coated surface showed totally no corrosion. Best Replacement for hot-dip galvanized.

Wood paint with high hardness



Ultra-High Abrasion Resistance



ASTM D4060, CS-17 for 100 rounds/1000g

Left: Hybrid resin ; Right: Commercial lacquer (for auto body)

Nano Ceramic Coating for Easy Clean



Water contact angle $>95^{\circ}$

Oil contact angle $>50^{\circ}$

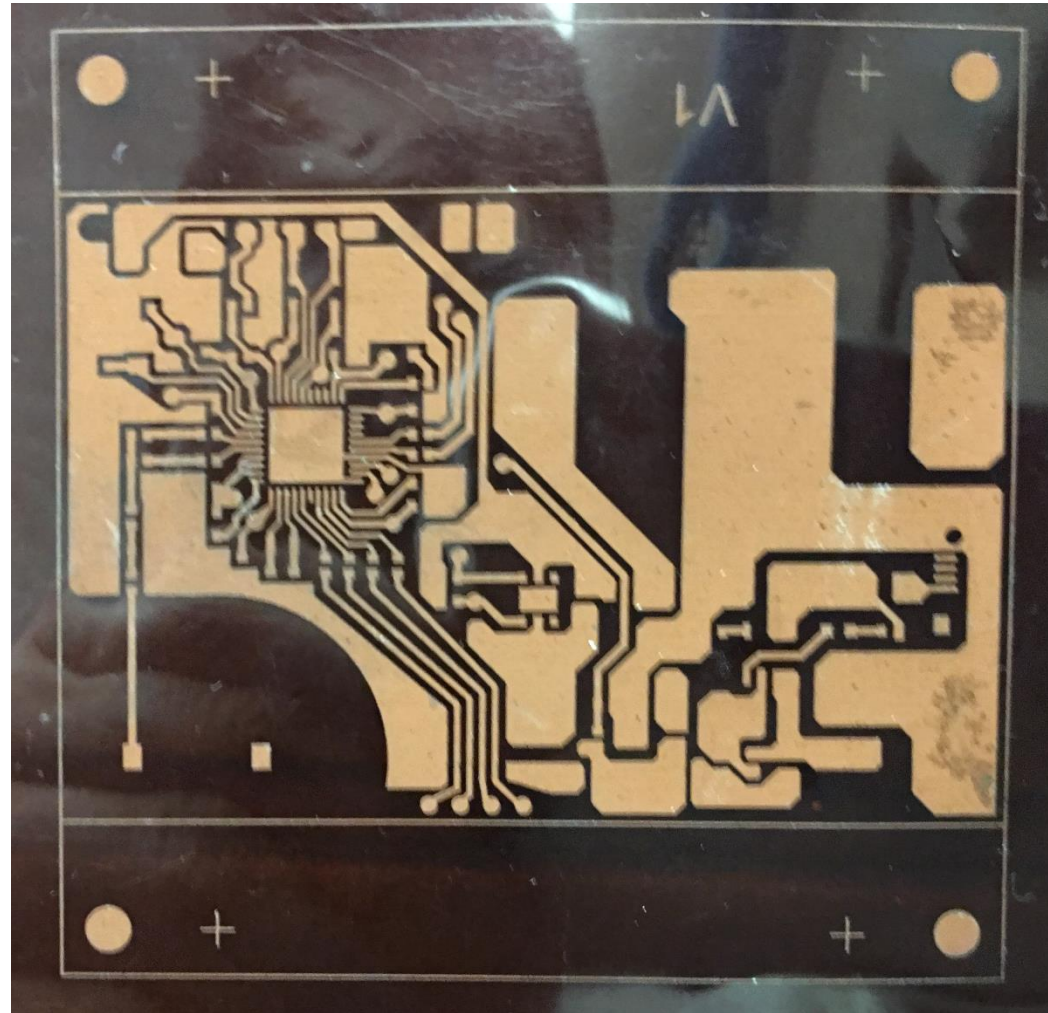
Clean surface with very low particle count

*Can apply on various metal alloys provides superior
Wear resistance, anti-fingerprint, high corrosion resistance and
excellence particle performance (best for semiconductor tools)*

Nano Hybrid Resin for Silicone Replacement



Nano Hybrid Resin for Nano Copper Ink



CB(4h)

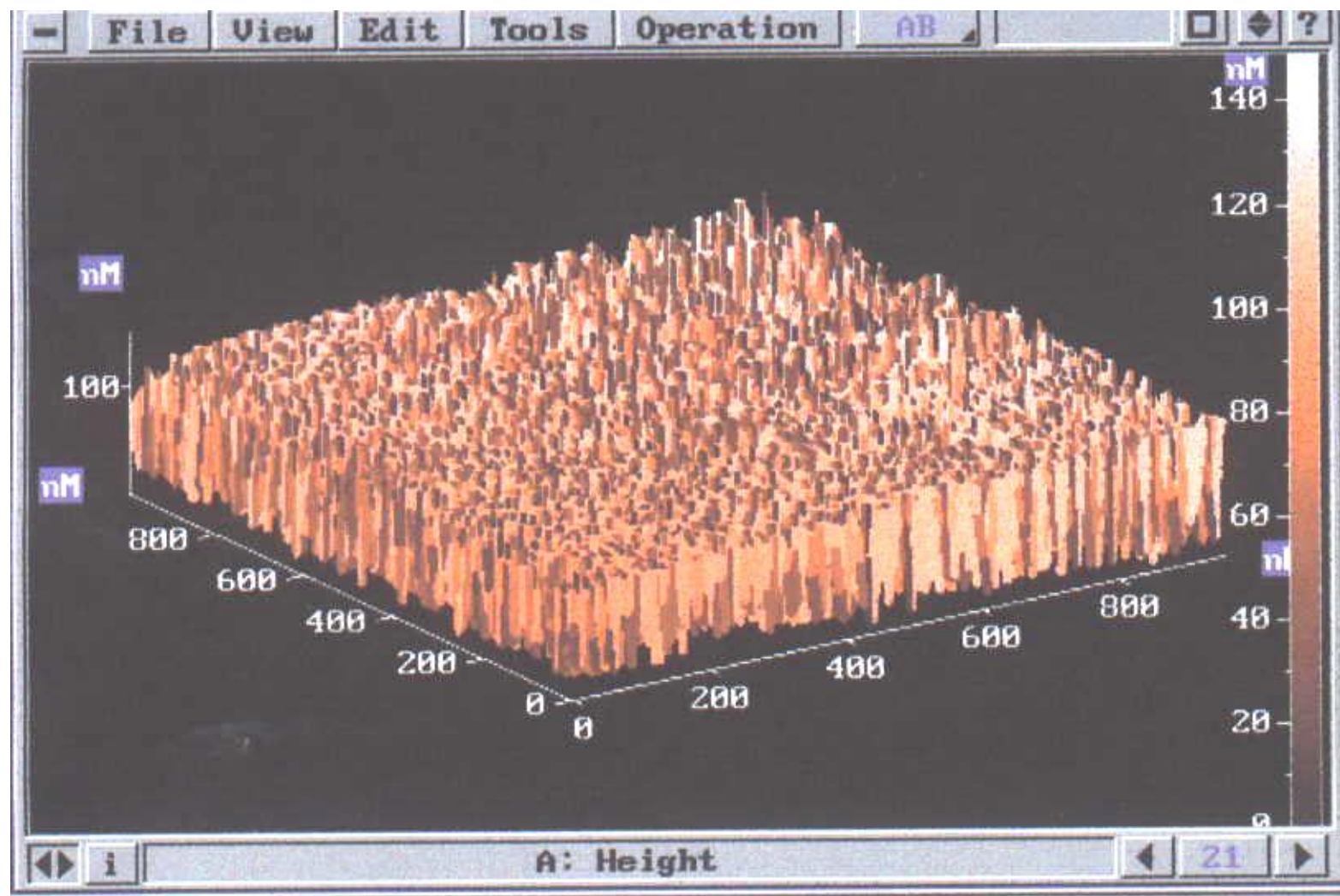
100,000×

20.0 kV

100nm

PhotoMet

#0012





Super hydrophilic coating

without coating

Anti-lotus effect for very low contact angle

Nano Ceramic Foam



Good thermal stability 、 fire retardant 、
low thermal conductivity ($k < 0.06$)

What Nano Resin Can Do?

1. replace organic resin from petrochemical industry in paintings and inks.
2. Combine biomaterials to replace petrochemical plastics and fabrics.
3. Combine recycling glass/plastics to replace concrete.

Stone age → Bronze age → Iron age → Light Metal → Plastics
→ **New Stone age**